Data Analysis Methods for Health Monitoring Sensors

Innovations in health monitoring systems are fundamental for the continuous improvement of remote healthcare. With the current presence of SARS-CoV-2, better known as COVID-19, in people's daily lives, solutions for monitoring heart and especially respiration and pulmonary functions are more needed than ever. Besides, health monitoring systems are widely used for patients who need isolated care, unconscious patients who cannot get medical attention for themselves. As it is well-known, monitoring systems rely on sensor technologies. Currently, there are multiple research studies for remote monitoring using different types of sensors. In this effort, we survey the current approaches that utilize the advantages of sensor technologies to sense, analyze, and estimate health data relate to respiration, heart, and sleep monitoring. The focus is to illustrate the algorithms based on signal processing (SP) and machine learning (ML)techniques used on each approach to facilitate researchers' understanding of how data is processed and streamed nowadays. We have classified sensors into two main categories: contact and contactless. Among these them, we classified three types of applications such as respiratory analysis, heart analysis, and sleep pattern estimation. In each category, we discuss the different types of used sensors, the data analysis technique, and the accuracy of those techniques. We expect this effort enables researcher to find new trends and gaps for improving the current state-of-the-art of in-home healthcare monitoring and know the remaining challenges.